SCIENTIFIC CALCULATOR
CALCULADOR CIENTIFICO

CASIO COLLEGE *fx-200P*

CASIO®

OPERATION MANUAL
MANUAL DE OPERACION

021A SA (英)(西) Printed in Japan

Dear customer,

Thank you very much for purchasing our scientific calculator.

This high-performance, pocket-size calculator employs true algebraic logic (judging the precedence of operations) and allows the use of up to 18 nesting parentheses at six levels. Its major features are 44 functions, seven memory registers, and up to 38 programmable steps for repeated calculation.

This booklet will familiarize you with the many ways this highly capable unit can serve you.

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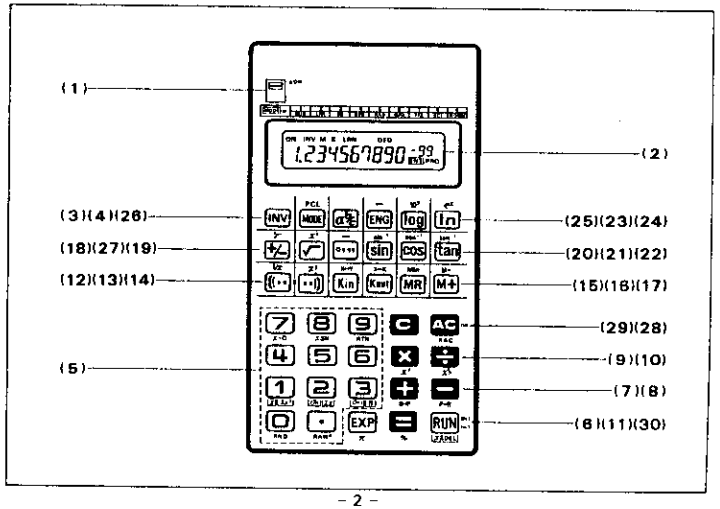
■ Internal registers (user registers)

X-register (display)	• Used in arithmetic and functional calculations
Y (L1)-register	
L2-register	• Used in calculations with nesting parentheses and for judging the precedence of addition/subtraction and multiplication/division.
L3-register	
L4-register	
L5-register	
L6-register	
M-register	• Independent memory register (M-, M+, MR)
K1 (Σx^2) register	• Constant memory registers (Kin, Kout, 1–5)
K2 (Σx) register	• For storing intermediate results (Σx^2, Σx, n) of statistical calculations (standard deviations).
K3 (n) register	
K4 register	
K5 register	
K6 register	

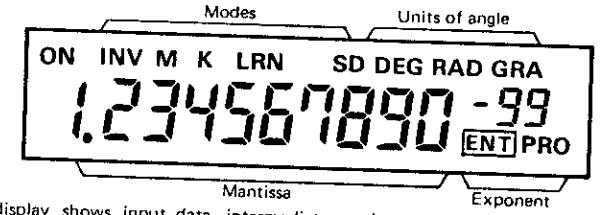
1/NOMENCLATURE



(1) Power switch

Turn ON the switch to activate the calculator and "ON" is displayed. Even when power is off, the contents held in independent memory and constant memory registers, and the programs are not lost.

(2) Display



The display shows input data, intermediate results and results of operation. The mantissa section displays up to 10 digits (9 for negative numbers). The exponent section displays up to ±99.
The fraction and angle in the sexagesimal scale are displayed as follows:

$456\frac{12}{23}$ is displayed . . . . . 456⌟12⌟23.

12°34'56.7" is displayed. . . . 12°34°56.7

"E" (error check, see page 10) may be displayed in the position of the mantissa's least significant digit. "DEG", "RAD" or "GRA" (angular unit), "INV" (when the INV key has been pressed), "M" (when data is stored in independent memory), "K" (during calculation with constants) and/or "SD" (during calculation of standard deviation), as well as "LRN" and "ENT" will be displayed to indicate the operating mode.

Auto power-off

If the calculator is left with the power switch at the "ON" position (except while programmed calculation), the auto power-off function automatically turns off the power in approximately 7 minutes, thereby saving battery life. Power is resumed either by pressing the AC key or by re-operating the ON-OFF switch.
(Even when power is off, the contents of memories and written programs as well as the angular unit and operating mode are not lost.)

(3) INV Inverse key

Activates the functions printed in brown on the keyboard.
When the INV key is pressed, "INV" appears on the display and the subsequent pressing of INV makes "INV" disappear.

(4) MODE Mode key

To put the calculator into the desired operating mode or select a specific angular unit, press MODE first, then 1, 2, 3, ... , or 5.

- MODE 1 : Manual and programmed calculations can be executed.
- MODE 2 : "LRN" is displayed. Programs can be written.
- MODE 3 : "SD" is displayed. Calculation of standard deviation can be executed.

* To carry out manual or programmed calculation, select the RUN mode (press MODE and 1).

- MODE 4 : "DEG" is displayed, indicating that "degrees" is selected as the unit of angle.
- MODE 5 : "RAD" is displayed, indicating that "radians" is selected as the unit of angle.
- MODE 6 : "GRA" is displayed, indicating that "gradient" is selected as the unit of angle.

(Note: 90 degrees = $\pi/2$ radians = 100 gradients)

- MODE 7 : "Fix" assignment (assignment for the number of fractional digits). Specify the number of digits of the fractional part after pressing MODE and 7. (Example: MODE 7 3 (three fractional digits are effective))
- MODE 8 : "Scientific" assignment (assignment for the number of significant digits). Specify the number of significant digits after pressing MODE and 8. (Example: MODE 8 4)
- MODE 9 : "Normal" assignment. Press in this sequence to release the "fix" or "scientific" assignment.

* To clear programs, press this key, following the INV key. (INV CL denotes this "program clear" sequence.)
* Once power is off, the "fix" and "scientific" assignments will be released but the operating mode ("LRN" or "SD") and the angular unit ("DEG", "RAD" or "GRA") will be kept.

(5) 0 — 9, . Numeral and decimal point keys

Enters numerals. For decimal places, use the . key in its logical sequence.

* Varying functions will be designated when you press INV and a numeral key, as summarized below.

- INV $\hat{x}$: Cutting off internal data
  The internal data (held in the Y-register) will be cut off so as to be equal to the displayed data.
- INV Ran# : Random number generation
  A random number between 0.000 and 0.999 will be generated.

* Use following sequences in calculation of standard deviation. For more details, refer to the chapter 6 "STANDARD DEVIATIONS".

- INV $\bar{x}$: Calculation of $\bar{x}$ (average)
- INV σ_n : Calculation of σ_n (population standard deviation)
- INV σ_{n-1} : Calculation of σ_{n-1} (sample standard deviation)

* Different functions will be designated when you press Ksum, then a numeral key as summarized below.

- Ksum $\bar{x}$: Calculation of Σx^2 (square sum)
- Ksum $\bar{x}$: Calculation of Σx (total sum)
- Ksum $\bar{x}$: Calculation of n (number of data)

* Use INV x≥0, INV x=0 and INV RTN only for writing programs (in "LRN" mode).

- INV x≥0 : Conditional jump
  "Return to the first step of the program when the contents of the X-register (display) is positive and otherwise go to the next step."
- INV x≤M : Conditional jump
  "Return to the first step of the program when the contents of the X-register is equal to or smaller than those of the M-register (independent memory) and otherwise go to the next step."

- INV RTN : Unconditional jump ("Return")
  Press these keys to return to the first step of the program unconditionally.

(6) EXP π Exponent/Pi entry key

- Enters the exponent of ten up to ±99. To enter 2.34×10^{56}, for example, press 2 . 3 4 EXP 5 6 in sequence **(symbolized by EXP)**.
- Enters circular constant in 10 digits (3.141592654) when pressed after 2nd, A, B, INV or a function command key **(symbolized by π)**.

(7) +/− Addition/Rectangular → polar key

- Enters summands.
- Performs rectangular to polar co-ordinates conversion when pressed after the INV key.

(8) M− Subtraction/Polar → rectangular key

- Enters minuend.
- Performs polar to rectangular co-ordinates conversion when pressed after the INV key.

(9) × x^y Multiplication/Power key

- Enters multiplicand.
- Raises the base x to yth power when pressed after the INV key.

(10) ÷ $\sqrt[y]{x}$ Division/Root key

- Enters dividend.
- Calculates the yth root of x when pressed after the INV key.

(11) = % Equal/Percent key

- Obtains answer.
- Perform regular percentages, add-ons, discounts, ratios and increase/decrease values when pressed after the INV key.

(12) ($1/x$ Open Parenthesis/Reciprocal key

- Opens the parentheses. Nesting of up to 18 parentheses at six levels is allowed.
- Obtains the reciprocal of the displayed number when pressed after the INV key. (In this manual this sequence is represented by INV 1/x. Other sequences described below are also represented in the same way.)

(13)) n! Close parenthesis/Factorial key

- Closes the parentheses.
- Obtains the factorial of the displayed number when pressed after the INV key.

(14) STO Constant memory entry/Register exchange key

- Enters numbers into each constant memory, through operation of ENTRY Kin 1 (to 5).

Example: To enter 12.3 into constant memory 3.
12 . 3 Kin 3

- Exchanges the displayed number (X-register) with the content of the working register (Y-register) when pressed after the INV key.

(15) RCL Constant memory recall/Register exchange key

- Recalls the contents in each constant memory without clearing, through operation of Kout 1 (to 5).

Example: To recall the contents of constant memory 5.
Kout 5

• Exchanges the displayed number (X-register) with the contents of a constant memory (K-register) when pressed after the [INV] key.

Example: To exchange the contents of constant memory 2 with the displayed number.
[INV] [x⇄K] [2]

(16) [M] Independent memory recall/Independent memory entry key

• Recalls the contents of the independent memory (M-register) without clearing.
• Puts the displayed number in the independent memory when pressed after the [INV] key. Old data held in the memory will be automatically erased.

(17) [M+] Memory plus (minus) key

• Adds the displayed number to the contents of the independent memory, and obtains answer in 4 basic calculations/x^2/$\sqrt{x}$ and automatically adds it to the contents of the memory.
• Subtracts the displayed number from the contents of the independent memory, and obtains answer in 4 basic calculations/x^2/$\sqrt{x}$ and automatically subtracts it from the contents of the memory when pressed after the [INV] key.

(18) [±] Sign change/Cube root key

• Changes the sign of the displayed number from plus to minus and vice versa.
• Extracts the cube root of the displayed number when pressed after the [INV] key.

(19) [°'"] Sexagesimal/Decimal conversion key

• Converts the sexagesimal figure to decimal notation.
• Converts the decimal notation to sexagesimal notation when pressed after the [INV] key.

(20) [sin] Sine/Arc sine key

• Obtains the sine of the displayed angle.
• Obtains the angle when pressed after the [INV] key.

(21) [cos] Cosine/Arc cosine key

• Obtains the cosine of the displayed angle.
• Obtains the angle when pressed after the [INV] key.

(22) [tan] Tangent/Arc tangent key

• Obtains the tangent of the displayed angle.
• Obtains the angle when pressed after the [INV] key.

(23) [log] Common logarithm/Antilogarithm key

• Obtains the common logarithm (base 10) of the displayed number.
• Calculates the xth power of 10 when pressed after the [INV] key.

(24) [ln] Natural logarithm/Exponential key

• Obtains the natural logarithm (base e) of the displayed number.
• Calculates the xth power of e (2.718281828) when pressed after the [INV] key.

(25) [ENG] Engineering key

Allows the displayed number to be shown with exponents of ten that are multiples of three (e.g., 10^3, 10^{-6}, 10^9).

Ex.) 12⊡3456

	12.3456
[ENG]	12.3456 00
[ENG]	12345.6 -03
[ENG]	12345600. -06
[ENG]	12345600. -06

12⊡3456

	12.3456
[INV] [ENG]	0.0123456 03
[INV] [FIX]	0.000012345 06
[INV] [SCI]	0.000000012 09
[INV] [ENG]	0.000000012 09
[ENG]	0.000012345 06
[ENG]	0.0123456 03

(26) [a b/c] Fraction entry key

• Enters fractions for fraction calculations. To enter the fraction 1-2/3, for example, [1] [a b/c] [2] [a b/c] [3] in sequence.

(27) [√ x²] Square root/Square key

• Extracts the square root of the displayed number.
• Obtains the square of the displayed number when pressed after the [INV] key.

(28) [ON AC] All clear key

• Clears the entire machine except the independent and constant memories, and also releases overflow or error check.
• Clears contents of all constant memories when pressed after the [INV] key.
• It also overrides the auto power-off function.

(29) [C] Clear key

Clears entry for correction.

(30) [RUN ENT HLT] RUN/ENT/HLT/Data entry/delete key

■ When a program is being written, depression of this key writes a halt instruction.

In the programmed operation mode, depression of this key restarts execution which has been temporarily suspended.

• [ENT] : When "LRN" is displayed (i.e.during program loading), depression of this key writes a halt instruction for data entry.
• [INV] [HLT] : When "LRN" is displayed, depression of this sequence writes a halt instruction for the display of a result.
• [RUN] : When execution is at a halt during programmed operation, depression of this key restarts execution.

■ When "SD" is displayed, this key works as a data entry/deletion key.

• [Σ] : In the SD mode, operate in the sequence of a data and [Σ].
• [INV] [DEL] : To delete the data which has just been input, press this sequence instead of [Σ] in the above sequences.

2/BATTERY MAINTENANCE

Two AA size manganese dry batteries (UM-3) give approximately 7,000 hours continuous operation (approx. 8,000 hours on type SUM-3).
When battery power decreases, the whole display darkens. Batteries should then be renewed. Be sure to switch OFF the power before changing.

Replacement of batteries:

1) Slide open the battery compartment lid on the back of the unit.
2) Remove dead batteries.
3) Insert new batteries with polarity as indicated.
4) Replace the battery compartment lid.
5) Press MODE 2 INV PGM MODE 1 INV SAVE INV MEM MODE LRN in sequence.

* Be sure to replace both batteries.
* Never leave dead batteries in the battery compartment as they may cause malfunctions.
* It is recommended that batteries be replaced every 18 months to prevent the chance of malfunctions due to battery leakage.

3/BEFORE USING THE CALCULATOR

Select the SD mode (press MODE 3) for standard deviation and the RUN mode (MODE 1) for ordinary arithmetic and functional calculations.
Select the LRN mode (MODE 2) to write a program.
Whatever angular unit is displayed does not matter in calculation which does not use angular data.

■ Precedence of operations and precedence levels

- This calculator automatically evaluates precedence of operations and executes in the proper sequence thus determined. The precedence of operations is as follows.

① Functions
② x^y, $x^{\frac{1}{y}}$
③ Multiplication and division
④ Addition and subtraction

Operations of the same precedence will be carried out in the order of input. An expression enclosed with a pair of parentheses will be given the highest precedence level.

- Internal registers L1 to L6 are used to retain intermediate results of operations, including expressions enclosed with parentheses, which have low precedence levels. Therefore, intermediate results of up to six levels may be retained.
- Up to three nested parentheses will be given the same precedence level. As a result, parentheses can be nested up to 18 pairs.
- How to evaluate precedence levels (an example of 4 levels and 5 pairs of nested parentheses)

Expression: $2\times\{\{(3+4\times\{(5+4)\div3\})\div5\}+9\}=$

Entry operation: 2 × ((3 + 4 × ((5 + 4) ÷ 3)) ÷ 5) + 9) =

1 level 1 level 1 level 1 level

Ⓐ

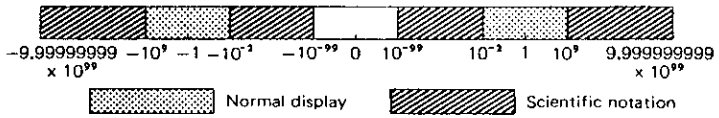
Contents of registers when entry has proceeded to Ⓐ

X	4
L1	((5+
L2	4×
L3	{((3+
L4	2×
L5	
L6	

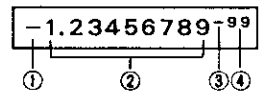
■ Correction

- If you are aware of data entry error before pressing a command key, press C and re-input the correct data.
- In a series of calculations, you can correct a wrong intermediate result of a functional calculation or within nested parentheses: press C and calculate the correct value, then resume the interrupted sequence of calculations.
- If you have pressed +, −, ×, ÷, INV y^x or INV $\sqrt[y]{\ }$ by mistake, you may press the correct key immediately. Note that, though the correct operation overrides the wrong one designated first, the precedence of operation of the first command remains effective.

■Calculation range and scientific notation



When the answer exceeds the normal display capacity, it is automatically shown by scientific notation, 10-digit mantissa and exponents of 10 up to ±99.



① The minus (−) sign for mantissa
② The mantissa
③ The minus (−) sign for exponent
④ The exponent of ten

The whole display is read: $-1.23456789 \times 10^{-99}$

* Entry can be made in scientific notation by using the [EXP] key after entering the mantissa.

EXAMPLE	OPERATION	READ-OUT
-1.23456789×10^{-3} (=−0.00123456789)	1⊡23456789[+/−]	−1.23456789
	[EXP]	−1.23456789 00
	3[+/−]	−1.23456789 −03

■Overflow or error check

Overflow or error is indicated by the "E." or "E." sign and stops further calculations.

Overflow or error occurs:

1) When an answer, whether intermediate or final, or accumulated total in the independent memory is more than 1×10^{100} ("E." sign appears).
2) When function calculations are performed with a number exceeding the input range ("E." sign appears).
3) When unreasonable operations are performed in standard deviations ("E." sign appears).
   Ex.) You attempt to obtain $\bar{x}$ or σ_n without any input data ($n = 0$).
4) When the total number of levels of explicitly and/or implicitly (with addition-subtraction versus multiplication-division including x^y and $\sqrt[y]{x}$) nested parentheses exceeds six, or more than 18 pairs of parentheses are used ("E." sign appears).
   Ex.) You have pressed the [(] key 18 times continuously before designating the sequence of 2 [+] 3 [×].

To release these overflow checks:

1), 2), 3) . . . . . Press the [AC] key.
4) . . . . . Press the [AC] key. Or press the [C] key, and the intermediate result just before the overflow occurs is displayed and the subsequent calculation is possible.

4/BASIC CALCULATIONS

* Set the function mode to "RUN" by pressing [MODE] [1].
* Calculations can be performed in the same sequence as the written formula (true algebraic logic).
* Nesting of up to 18 parentheses at six levels is allowed.

4-1 Four basic calculations

EXAMPLE	OPERATION	READ-OUT
$23+4.5-53=-25.5$	23[+]4⊡5[−]53[=]	−25.5
$56\times(-12)\div(-2.5)=268.8$	56[×]12[+/−][÷]2⊡5[+/−][=]	268.8
$2\div3\times(1\times10^{20})=6.666666667\times10^{19}$	2[÷]3[×]1[EXP]20[=]	6.666666667 19
$3+\underline{5\times6}\,(=3+30)=33$	3[+]5[×]6[=]	33.
$\underline{7\times8}-\underline{4\times5}\,(=56-20)=36$	7[×]8[−]4[×]5[=]	36.
$1+2-\underline{3\times4\div5}+6=6.6$	1[+]2[−]3[×]4[÷]5[+]6[=]	6.6
$\frac{6}{4\times5}=0.3$	4[×]5[+]6[M+][=]	0.3

* The number of depression of the [)] key can be displayed.

$2\times\{7+6\times(5+4)\}=122$	2[×][(]	C01 0.
	7[+]6[×][(]	C02 0.
	5[+]4[)][)][=]	122.
$(2+3)\times4=20$	[(]2[+]3[)][×]4[=]	20.
$\frac{3+4\times5}{5}=(3+4\times5)\div5=4.6$	[(]3[+]4[×]5[)][÷]5[=]	4.6

* It is unnecessary to press the [)] key before the [=] key.

$10-(7\times(3+6))=-53$	10[−][(]7[×][(]3[+]6[=]	−53.

Another operation:
10[−][(]7[×]3[+]6[)][)][=]

4-2 Assignment for the number of fractional digits and the number of significant digits

* To designate the number of fractional digits, press [MODE][7] n in sequence.
  To designate the number of significant digits, press [MODE][8] n.
* The "FIX" and/or "SCI" assignment will not be released until another assignment is made or [MODE][9] is pressed. (Power-off and auto power-off release the assignments.)
* Even when "FIX" and/or "SCI" is assigned, internal data use 11-digit mantissa. Press in the sequence [INV][CM/ENG] to make the internal and displayed data equal.
* Press [ENG] and the data will be converted to representation with the exponent of which is a multiple of three.

EXAMPLE	OPERATION	READ-OUT
100÷6=16.66666666.....	100÷6=	16.66666667
(Specifies four fractional digits)	[MODE][7][4]	16.6667
(Releases assignment)	[MODE][9]	16.66666667
(Specifies five significant digits)	[MODE][8][5]	1.6667 01
	[MODE][9]	16.66666667

* When an assignment for the number of digits is made, the data displayed is rounded up or down lowest digit position in the specified range but internal data remain unchanged in the registers. The assignment can be made at any time before or in the middle of calculation.

200÷7×14=400	[MODE][7][3]	0.000
	200÷7=	28.571
(Continues calculation with internal data consisting of 11 digits.)	×14=	400.000

To perform the same calculation with internal rounding

	200÷7=	28.571
(Internal rounding)	[INV][CM/ENG]×14=	399.994
(Releases assignment)	[MODE][9]	399.994
123m×456=56088m	123×456=	56088.
=56.088km	[ENG]	56.088 03
7.8g÷96=0.08125g	7÷8÷96=	0.08125
=81.25mg	[ENG]	81.25 −03

4-3 Constant calculations

* The "K" sign appears when a number is set as a constant.

EXAMPLE	OPERATION	READ-OUT
3+2.3=5.3	2÷3+[K]3=	K 5.3
6+2.3=8.3	6=	K 8.3
7−5.6=1.4	5÷6−[K]7=	K 1.4
−4.5−5.6=−10.1	4÷5[+/−]=	K −10.1
2.3×12=27.6	12×[K]2÷3=	K 27.6
(−9)×12=−108	9[+/−]=	K −108.
74÷2.5=29.6	2÷5=[K]74=	K 29.6
85.2÷2.5=34.08	85÷2=	K 34.08
17+17+17+17=68	17+[K]=	K 34.
	=	K 51.
	=	K 68.
$1.7^2=2.89$	1÷7×[K]=	K 2.89
$1.7^3=4.913$	=	K 4.913
$1.7^4=8.3521$	=	K 8.3521
3×6×4=72	3×6×[K]	K 18.
3×6×(−5)=−90	4=	K 72.
	5[+/−]=	K −90.
$\frac{56}{4\times(2+3)}=2.8$	4×[(]2+3[)]=[K]	K 20.
	56=	K 2.8
$\frac{23}{4\times(2+3)}=1.15$	23=	K 1.15

4-4 Memory calculations using the independent memory

* When a new number is entered into the independent memory by the M+ key, the previous number stored is automatically cleared and the new number is put in the independent memory.
* The "M" sign appears when a number is stored in the independent memory.
* The contents accumulated into the independent memory are preserved even after the power switch is turned off.
  To clear the contents press ON INV MR or AC INV MR in sequence.

EXAMPLE	OPERATION	READ-OUT
53+6= 59	53 + 6 = M+	M 59.
23−8= 15	23 − 8 M+	M 15.
56×2=112	56 × 2 M+	M 112.
+) 99÷4= 24.75	99 ÷ 4 M+	M 24.75
210.75	MR	M 210.75

7+7−7+ (2×3) + (2×3) + (2×3) − (2×3) =19

7 INV M+ INV M− 2 × 3 M+ M+ INV M− MR	M 19.

12×3= 36	3 × × 12 = INV M+	M K 36.
−) 45×3=135	45 INV M−	M K 135.
78×3=234	78 M+	M K 234.
135	MR	M K 135.

4-5 Memory calculations using 6 constant memories

* When a new number is entered into a constant memory by operating ENTRY Kin (1 to 6), the previous number stored is automatically cleared and the new number is put in the constant memory.
* The contents stored in the constant memories are preserved even after the power switch is turned off.
  To clear the contents press ON Kin 1 (to 6) or AC Kin 1 (to 6) in sequence.

EXAMPLE	OPERATION	READ-OUT
193.2÷23=8.4	193 ÷ 2 Kin 1 + 23 =	8.4
193.2÷28=6.9	Kout 1 + 28 =	6.9
193.2÷42=4.6	Kout 1 + 42 =	4.6

* Another operations by using the independent memory:

193 ÷ 2 INV M+ + 23 =, MR + 28 =, MR + 42 =

EXAMPLE	OPERATION	READ-OUT
$\frac{9\times6+3}{(7-2)\times8}=1.425$	9 × 6 + 3 = Kin 1	57.
	7 − 2 = M+ × 8 = Kin 2	40.
	Kout 1 + Kout 2 =	1.425

* Calculations in constant memory registers can also be performed by using the +, −, × and ÷ keys.

	7 Kin 1 × 8 Kin 2 × 9 Kin 3 = INV M+	M 504.
	4 Kin + 1 × 5 Kin + 2 × 6 Kin + 3 M+	M 120.
	3 Kin + 1 × 6 Kin + 2 × 9 Kin + 3 M+	M 162.
7 × 8 × 9=504	Kout 1	M 14.
4 × 5 × 6=120	Kout 2	M 19.
3 × 6 × 9=162	Kout 3	M 24.
(Total) 14 19 24 786	MR	M 786.

12× (2.3+3.4) −5=63.4

30× (2.3+3.4+4.5) −15 ×4.5=238.5

12 × (2 . 3 + 3 . 4) Kin 1 − 5 =	63.4
30 × 4 . 5 Kin + 1 INV x⇔K 1 − 15 × Kout 1 =	238.5

To exchange the displayed number (4.5) with the contents of constant memory 1.

4-6 Fraction calculations

* The display capacity of a fraction, whether entry or result, is limited to a max. 3 digits for each integer, numerator or denominator part and at the same time to a max. 8 digits in the sum of each part. When an answer exceeds the above capacity, it is automatically converted to the decimal scale.
* A fraction can be transferred to the independent memory and the constant memories.
* A fraction answer can be converted to the decimal scale by pressing the a b/c key. However, a decimal answer cannot be converted to the fraction scale.

EXAMPLE	OPERATION	READ-OUT
$4\frac{5}{6}\times(3\frac{1}{4}+1\frac{2}{3})\div7\frac{8}{9}=3\frac{7}{568}$	4 a b/c 5 a b/c 6 × 3 a b/c 1 a b/c 4 +	
(=3.012323944)	1 a b/c 2 a b/c 3 − 7 a b/c 8 a b/c 9 =	3⌟7⌟568.
	a b/c	3.012323944

EXAMPLE	OPERATION	READ-OUT
$2\frac{4}{5}+\frac{3}{4}-1\frac{1}{2}=2\frac{1}{20}$	2 a b/c 4 a b/c 5 + 3 a b/c 4 −	3⌟11⌟20.
	a b/c	3.55
	1 a b/c 1 a b/c 2 =	2⌟1⌟20.
$(1.5\times10^{7})-\{(2.5\times10^{6})\times\frac{3}{100}\}$		
$=14925000$	1 (5 EXP 7 − 2 (5 EXP 6 × 3 a b/c 100 =	14925000.

* During a fraction calculation, a figure is reduced to the lowest terms by pressing a function command key (+, −, × or ÷) or the = key if the figure is reducible.

$3\frac{456}{78}=8\frac{11}{13}$ (Reduction)	3 a b/c 456 a b/c 78	3⌟456⌟78.
	=	8⌟11⌟13.
$\frac{12}{45}-\frac{32}{56}=-\frac{32}{105}$	12 a b/c 45 =	4⌟15.
	32 a b/c 56 =	−32⌟105.

* The answer in a calculation performed between a fraction and a decimal is displayed as a decimal.

$\frac{41}{52}\times78.9=62.20961538$	41 a b/c 52 ×	41⌟52.
	78 (9 =	62.20961538

4-7 Percentage calculations

EXAMPLE	OPERATION	READ-OUT
12% of 1500 180	1500 × 12 INV %	180.
Percentage of 660 against 880 . . 75%	660 + 880 INV %	75.
15% add-on of 2500 2875	2500 × 15 INV % +	2875.
25% discount of 3500 2625	3500 × 25 INV % −	2625.
300cc is added to a solution of 500cc. What is the percent of the new volume to the initial one?	300 + 500 INV %	160. (%)
If you made $80 last week and $100 this week, what is the percent increase?	100 − 80 INV %	25. (%)

EXAMPLE	OPERATION	READ-OUT
12% of 1200 . . . . . 144 18% of 1200 . . . . . 216 23% of 1200 276	1200 × × 12 INV % 18 INV % 23 INV %	K 144. K 216. K 276.
26% of 2200 . . . . . 572 26% of 3300 . . . . . 858 26% of 3800 988	26 × × 2200 INV % 3300 INV % 3800 INV %	K 572. K 858. K 988.
Percentage of 30 against 192 . . . . . 15.625% Percentage of 156 against 192 . . . . . 81.25%	192 + + 30 INV % 156 INV %	K 15.625 K 81.25
600 grams was added to 1200 grams. What percent is the total to the initial weight? . . . . . 150% 510 grams was added to 1200 grams. What percent is the total to the initial weight? 142.5%	1200 + + 600 INV % 510 INV %	K 150. K 142.5
How many percent down is 138 grams to 150 grams? . . . . . down 8% How many percent down is 129 grams to 150 grams? . . . . . down 14%	150 − − 138 INV % 129 INV %	K −8. K −14.

5/FUNCTION CALCULATIONS

* Scientific function keys can be utilized as subroutines of four basic calculations (including parenthesis calculations).
* In some scientific functions, the display disappears momentarily while complicated formulas are being processed. So do not enter numerals or press a function key until the previous answer is displayed.
* For each input range of the scientific functions, refer to page 34.

5-1 Degree-Minute-Second ↔ Decimal conversion

The [→] key converts the sexagesimal figure (degree, minute and second) to decimal notation. Operation of [INV] [→] converts the decimal notation to the sexagesimal notation.

EXAMPLE	OPERATION	READ-OUT
$14°25'36" = 14.42666667°$	14 [→]	14.
	25 [→]	14.41666667
	36 [→]	14.42666667
	[INV] [→]	14°25°36.

5-2 Trigonometric/Inverse trigonometric functions

EXAMPLE	OPERATION	READ-OUT
$\sin\left(\frac{\pi}{6}\text{rad}\right) = 0.5$	"RAD" ([MODE] [3]) [π] [÷] 6 [=] [sin]	0.5
$\cos 63°52'41" = 0.440283084$	"DEG" ([MODE] [4]) 63 [→] 52 [→] 41 [→]	63.87805555
	[cos]	0.440283084
$\tan(-35\text{gra}) = -0.61280078$	"GRA" ([MODE] [5]) 35 [+/-] [tan]	-0.61280078
$2\cdot\sin 45° \times \cos 65° = 0.597672477$	"DEG" 2 [×] 45 [sin] [×] 65 [cos] [=]	0.597672477
$\sin^{-1}\frac{1}{2} = 30°$	"DEG" 1 [a b/c] 2 [INV] [sin]	30.
$\cos^{-1}\frac{\sqrt{2}}{2} = 0.785398163\text{rad}$	"RAD" 2 [√] [÷] 2 [=] [INV] [cos]	0.785398163
$\tan^{-1} 0.6104 = 31.39989118°$	"DEG" [.] 6104 [INV] [tan]	31.39989118
$= 31°23'59.61"$	[INV] [→]	31°23°59.61
$\sin^{-1}0.8 - \cos^{-1}0.9 = 27°17'17.41"$	"DEG" [.] 8 [INV] [sin] [−] [.] 9 [INV] [cos] [=]	27.28816959
	[INV] [→]	27°17°17.41

5-3 Common & Natural logarithms/Exponentiations (Antilogarithms, Exponentials, Powers and Roots)

EXAMPLE	OPERATION	READ-OUT
$\log 1.23 (= \log_{10} 1.23) = 0.089905111$	1 [.] 23 [log]	0.089905111
$\ln 90 (= \log_e 90) = 4.49980967$	90 [ln]	4.49980967
$\log 456 \div \ln 456 = 0.434294481$	456 [INV] [10^x] [log] [+] [MR] [ln] [=]	M 0.434294481
$10^{1.23} = 16.98243652$	1 [.] 23 [INV] [log]	16.98243652
$e^{4.5} = 90.0171313$	4 [.] 5 [INV] [e^x]	90.0171313
$10^{0.4} + 5\cdot e^{-3} = 2.760821773$	[.] 4 [INV] [log] [+] 5 [×] 3 [+/-] [INV] [e^x] [=]	2.760821773
$5.6^{2.3} = 52.58143837$	5 [.] 6 [INV] [x^2] 2 [.] 3 [=]	52.58143837
$123^{\frac{1}{7}} (= \sqrt[7]{123}) = 1.988647795$	123 [INV] [x^2] 7 [=]	1.988647795
$(78-23)^{-12} = 1.30511183\times10^{-21}$	[(-)] 78 [−] 23 [)] [INV] [x^2] 12 [+/-] [=]	1.30511183^-21
$3^{12} + e^{10} = 553467.4658$	3 [INV] [x^2] 12 [+] 10 [INV] [e^x] [=]	553467.4658
$\log\sin 40° + \log\cos 35° = -0.27856798$	"DEG" ([MODE] [4]) 40 [sin] [log] [+] 35 [cos] [log] [=]	-0.27856798
	[INV] [10^x]	0.526540784
(The antilogarithm . . . . . 0.526540784)		
$15^{\frac{1}{5}} + 25^{\frac{1}{6}} + 35^{\frac{1}{7}} = 5.090557037$	15 [INV] [x^2] 5 [+] 25 [INV] [x^2] 6 [+] 35 [INV] [x^2] 7 [=]	5.090557037

EXAMPLE	OPERATION	READ-OUT
* x^y and $x^{\frac{1}{y}}$ can be registered as a constant.		
$4^{2.6}=32$	2 ÷ 5 [INV] [x^y] [INV] [x^y] 4 =	* 32.
$0.16^{2.6}=0.01024$	÷ 16 =	* 0.01024
$9^{2.6}=243$	9 =	* 243.

5-4 Square roots, Cube roots, Squares, Reciprocals, Factorials & Random numbers

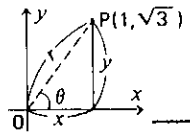
EXAMPLE	OPERATION	READ-OUT
$\sqrt{2}+\sqrt{3}\times\sqrt{5}=5.287196908$	2 [√] + 3 [√] × 5 [√] =	5.287196908
$\sqrt[3]{36\times42\times49}=42$	36 × 42 × 49 = [INV] [$\sqrt[3]{}$]	42.
$123+30^2=1023$	123 + 30 [INV] [x^2] =	1023.
$\frac{1}{\frac{1}{3}-\frac{1}{4}}=12$	3 [INV] [1/x] − 4 [INV] [1/x] = [INV] [1/x]	12.
$8!\ (=1\times2\times3\times\cdots\cdots\times7\times8)=40320$	8 [INV] [$x!$]	40320.
Generate a random number between 0.000 and 0.999.	[INV] [RAN#]	0.570 (Example)

5-5 Rectangular to polar co-ordinates conversion

Formula: $r=\sqrt{x^2+y^2}$

$\theta=\tan^{-1}\frac{y}{x}\quad(-180^\circ<\theta\leqq180^\circ)$

Ex.)
Find the length r and angle θ in radian when the point P is shown as $x = 1$ and $y = \sqrt{3}$ in the rectangular co-ordinates.

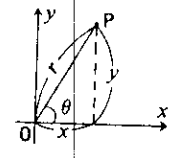


	OPERATION	READ-OUT	
"RAD" ([MODE] 5)	1 [INV] [R→P] 3 =	2.	(r)
	[INV] [x⇔y]	1.047197551	(θ in radian)

5-6 Polar to Rectangular co-ordinates conversion

Formula: $x = r\cdot\cos\theta$
$y = r\cdot\sin\theta$

Ex.)
Obtain the values of x and y when the point P is shown as $\theta = 60^\circ$ and length $r = 2$ in the polar co-ordinates.



	OPERATION	READ-OUT	
"DEG" ([MODE] [4])	2 [INV] [P→R] 60 =	1.	(x)
	[INV] [x⇔y]	1.732050808	(y)

5-7 Applications

■Decibel (dB) conversion

Ex.)
How many dB of amplifier gain is in an amp with 5mW of input power and 43W of output power?

Formula: $dB = 10\cdot\log_{10}\frac{P_2}{P_1}$

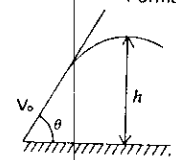
P_1 : Input power (W)
P_2 : Output power (W)

OPERATION	READ-OUT	
10 × [log] 43 ÷ 5 [ln] 3 [1/x] [log] =	39.34498451	(dB)

■Parabolic movement

Ex.)
Obtain the height of a ball 3 seconds after throwing it at a 50° angle and at an initial velocity of 30 m/sec. (not calculating air resistance).

Formula: $h = V_0 t\sin\theta - \frac{1}{2}gt^2$

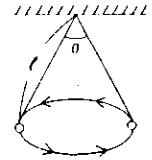


h : Height of ball at T seconds after thrown (m)
V_0 : Initial velocity (m/sec.)
t : Time (sec.)
θ : Throwing angle to level surface
g : Gravitational acceleration (9.8 m/sec.^{2})

	OPERATION	READ-OUT	
"DEG" ([MODE] [4])	30 × 3 × 50 [sin] − 1 [cos] 2 × 9 ÷ 8 × 3 [INV] [x^2] =	24.84399988	(m)

■Cycle of a conical pendulum

Ex.)
How many seconds is the cycle of a conical pendulum with a cord length of 30 cm and maximum swing angle of 90°?



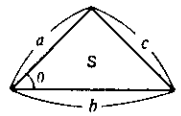
Formula: $T = 2\pi \cdot \sqrt{\frac{\ell \cdot \cos\frac{\theta}{2}}{g}}$

T : Cycle (sec.)
ℓ : Cord length (m)
θ : Maximum cord swing angle
g : Gravitational acceleration (9.8 m/sec.²)

OPERATION	READ-OUT
"DEG"	
(MODE 4) 2 × π × (3 ÷ 90 + 2) cos + 9 ÷ 8) √ =	0.924421332 (sec.)

■Triangle

Ex.)
Calculate the interior angle (θ) and area (S) of the triangle when the lengths of three sides (a, b and c) are given.



a: 18 m, b: 21 m, c: 12 m

Formula: $\cos\theta = \frac{a^2 + b^2 - c^2}{2ab}$

$S = \frac{1}{2}ab \cdot \sin\theta$

OPERATION	READ-OUT
"DEG"	
(MODE 4) 18 Ans 1 x^2 + 21 Ans 2 x^2 − 12 x^2 = =	
Ans 1 × Ans 2 × 2 − cos⁻¹ =	34°46°19. (θ)
sin × MR + 2 =	107.7888561 (m²)

■Pro-rating

Division	Sales amount	%
A	$ 84	22.4
B	153	40.8
C	138	36.8
Total	375	100.0

OPERATION	READ-OUT
84 + 153 + 138 =	375.
100 × 84 ÷ 375 M+	M 22.4
153 ÷ 375 M+	M 40.8
138 ÷ 375 M+	M 36.8
MR	M 100.

■Time calculations

1 hr. 27 min. 58 sec.
1 hr. 35 min. 16 sec.
+) 1 hr. 41 min. 12 sec.
4 hr. 44 min. 26 sec.
Average: 1 hr. 34 min. 48.67 sec.

OPERATION	READ-OUT
1 °'" 27 °'" 58 °'" +	
1 °'" 35 °'" 16 °'" +	
1 °'" 41 °'" 12 °'" =	4°44°26.
+ 3 =	1°34°48.67

6/STANDARD DEVIATIONS

* Be sure to press [2nd][CL] in sequence prior to starting a calculation of standard deviation.
* Set the function mode to "SD" by pressing [MODE][2].

Ex.) Find σ_{n-1}, σ_n, $\bar{x}$, n, Σx and Σx^2 based on the data 55, 54, 51, 55, 53, 53, 54, 52.

	OPERATION	READ-OUT
"SD"	[2nd][CL]	
	55 [DT] 54 [DT] 51 [DT] 55 [DT] 53 [DT] [DT]	
	54 [DT] 52 [DT]	52.
(Sample standard deviation)	[2nd][σ_{n-1}]	1.407885953
(Population standard deviation)	[2nd][σ_n]	1.316956719
(Arithmetic mean)	[2nd][$\bar{x}$]	53.375
(Number of data)	[Recall][n]	8.
(Sum of value)	[Recall][Σx]	427.
(Sum of square value)	[Recall][Σx^2]	22805.

Calculate the unbiased variance and the deviation between each data item and the average.

(Subsequently) [2nd][σ_{n-1}][2nd][x^2]	1.982142857	(Unbiased variance)
[2nd][$\bar{x}$][−][−]55[=]	1.625	(55 − $\bar{x}$)
54[=]	0.625	(54 − $\bar{x}$)
51[=]	−2.375	(51 − $\bar{x}$)
⋮	⋮	

Note: The sample standard deviation σ_{n-1} is defined as

$$\sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}}$$

the population standard deviation σ_n is defined as

$$\sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n}}$$

and the arithmetical mean $\bar{x}$ is defined as $\frac{\Sigma x}{n}$

* Pressing [2nd][σ_{n-1}], [2nd][σ_n], [$\bar{x}$], [n], [Σx], or [Σx^2] key need not be done sequentially.

Ex.) Find n, $\bar{x}$ & σ_{n-1} based on the data: 1.2, −0.9, −1.5, 2.7, −0.6, 0.5, 0.5, 0.5, 0.5, 1.3, 1.3, 1.3, 0.8, 0.8, 0.8, 0.8, 0.8.

	OPERATION	READ-OUT
"SD"	[2nd][CL] 1[.]2[DT][.]9[+/−][DT]	−0.9
① (Mistake)	2[.]5[+/−]	−2.5
① (To correct)	[C]	0.
	1[.]5[+/−][DT]	−1.5
	2[.]7[DT]	2.7
② (Mistake)	[DT]	2.7
③ (Mistake)	1[.]6[+/−][DT]	−1.6
③ (To correct)	[2nd][CL]	−1.6
	[.]6[+/−][DT]	−0.6
② (To correct)	2[.]7[2nd][CL]	2.7
	[.]5[×]	0.5
	4[DT]	0.5
④ (Mistake)	1[.]4[×]	1.4
④ (To correct)	[AC]	0.
	1[.]3[×]3[DT]	1.3
	[.]8[×]	0.8
⑤ (Mistake)	6[DT]	0.8
⑤ (To correct)	[.]8[×]6[2nd][CL]	0.8
	[.]8[×]5[DT]	0.8
	[Recall][n]	17.
	[2nd][$\bar{x}$]	0.635294117
	[2nd][σ_{n-1}]	0.95390066

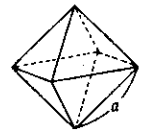
7/PROGRAMMED CALCULATIONS

* This calculator has a program memory of 38 steps.
* To store a program (mathematical procedure) in the calculator, execute ordinary (i.e. manual) calculation in the LRN mode (press MODE 2) only once.
* Now the calculator has memorized the program. Input data and press the RUN key in the RUN mode (press MODE 1), and the calculator executes the program with the data. This is very convenient for repeating calculations with varying sets of data.

■ How to store and execute programs

Example 1:
Calculate the surface areas (S) of regular octahedrons whose ridges are respectively 10, 7 and 15 cm long.

Formula: $S = 2\sqrt{3}a^2$



Ridge length (a)	Surface area
10 cm	(346.41) cm²
7	(169.74)
15	(779.42)

* Values enclosed with parentheses are to be obtained.

* The following sequence of key operations realizes a mathematical procedure of the above formula.

2 × 3 √ × 10 x^2 = → S
↑
Value of a (data)

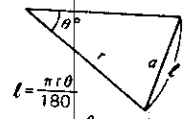
* Operate the above sequence in the LRN mode (MODE 2). Note that EXT must be pressed prior to data entry (the value of a in this case).

OPERATION		READ-OUT	
(Select LRN mode)	MODE 2	LRN 0. PRO	LRN and PRO lit.
	2	LRN 2. PRO	
	×	LRN 2. PRO	
	3	LRN 3. PRO	
	√	LRN 1.732050808 PRO	The mathematical procedure is stored.
	×	LRN 3.464101615 PRO	
(Input data)	EXT 10	LRN 10. PRO	
	INV x^2	LRN 100. PRO	
	=	LRN 346.4101615 PRO	S for a = 10

Execution of the program stored (LRN disappears)

(Select RUN mode)	MODE 1	346.4101615
(Execute program)	RUN	3.464101615 PRO
	7 RUN	169.7409791 — S for a = 7
	RUN 15 RUN	779.4228634 — S for a = 15

Example 2:
Calculate the length, ℓ of the arc and the length, a of the chord of a sector with radius and radii making an angle of $\theta°$.



$\ell = \frac{\pi r \theta}{180}$

$a = 2r\sin\frac{\theta}{2}$

Radius (r)	Angle of radii (θ)	Arc length (ℓ)	Chord length (a)
10 cm	60°	(10.47) cm	(10) cm
12	42°34'	(8.91)	(8.71)
15	36°	(9.42)	(9.27)

* The values enclosed with parentheses are to be obtained.

OPERATION		READ-OUT	
(Select LRN mode)	MODE 2	LRN 0. PRO	
	MODE 4 EXT 10	LRN DEG 10. PRO	r → To K1 register
	Kin 1 × EXT 60	LRN DEG 60. PRO	θ → To K2 register
	Kin 2 × π ÷ 180 =		
	INV KU	LRN DEG 10.47197551 PRO	HLT for displaying result (ℓ)
	2 Kin × 1 Kin ÷ 2		K1 x 2, K2 ÷ 2
	Kout 2 sin Kin × 1		$\sin\frac{\theta}{2}$ x K1
	Kout 1	LRN DEG 10. PRO	Result (a)

Execution of the program stored. (LRN disappears)

(Select RUN mode)	MODE 1	DEG 10.	
(Execute program)	RUN	DEG 10. PRO	
(Input r)	12 RUN	DEG 12. PRO	
(Input θ)	42 ⁻⁻ 34 ⁻⁻ RUN	DEG 8.915141819 PRO	Result (ℓ)
(Subsequently)	RUN	DEG 8.711524731	Result (a)
	RUN 15 RUN 36 RUN	DEG 9.424777961 PRO	Result (ℓ)
(Subsequently)	RUN	DEG 9.270509832	Result (a)

■ Program step

• The program of Example 2 is stored (written) in the calculator as shown below.

No. of steps	Program
1	MODE 4
2	ENT
3	Kin 1
4	x
5	ENT
6	Kin 2
7	x
8	π
9	÷
10	1
11	8
12	0
13	=
14	INV HLT
15	2
16	Kin x 1
17	Kin ÷ 2
18	Kout 2
19	sin
20	Kin x 1
21	Kout 1
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
⋮	⋮
36	
37	
38	

- The program capacity is 38 steps.
- An error results ("E" displayed) when there is an attempt to write the 39th step. No subsequent steps can be written. In this case, press [AC] to release the error check.
- After the program is started, instruction steps are executed one after another and execution does not stop. But it is needed to halt execution for inputting a data or reading a result. This is accomplished by [INV] and [INV] [HLT]. When the end of a program is reached, execution stops automatically and the state is displayed. So, HLT may be absent.
- Each function comprises a step of program. The depression of keys in a certain sequence produces a single program step if it generates a single function.
  1) Functions generated by the depression of a single key
     Ex.) Numeral value, +/−, +, −, x, ÷, =, [(,)], sin, log, ENT, ...
  2) Functions generated by the depression of a two-key sequence
     Ex.) INV x^2, INV $\sqrt[3]{\ }$, INV $\sin^{-1}$, INV X↔Y, INV x^y, INV R→P, Kin 2, INV RAN#, ...
  3) Functions generated by the depression of a three-key sequence
     Ex.) INV X↔K 5, MODE 8 3 (Assignment for the number of significant digits), Kin x 3 (Multiplication with contents of K3 register), ...

* If you have misoperated when writing a program (i.e. in the LRN mode), press the sequence of [INV] [PGM] and perform the correct operation.

* An old program will be automatically overwritten by a new program.

* The depression of a data entry key ([.], [0] – [9]) followed by [Σ+], [x̄], [Sy], [EE] or [CE] will not be written in if such a sequence immediately follows the depression of [INV]. Note that one of the functions which does not follow a numeric data will be written in as a step.

Example:

[INV] 6 [EE] 6 [EE] 6 [EE]

Not written in

[INV] 6 [EE] [EE] [EE]

Not written in — Written (2 steps)

■ Jump instructions

There are two types of jump instructions as follows.

1. **Unconditional return to the first step of program: RTN**
   Write the sequence of [INV] [RTN] at the end of a program to execute it repeatedly.

Example: Let us use the unconditional return instruction in the regular octahedron program explained on page 26. (In this case, the formula must be modified to $S = a^2 \times 2\sqrt{3}$.)

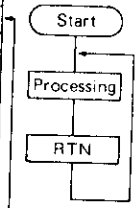
Operation:

[MODE] [2]
[INV] 10 [INV] [x^2] [×] 2 [×] 3 [√] [=] [INV] [RTN]

Value of a ↑ — ↑ Return instruction

Step No.	Instruction step
1	ENT
2	INV x^2
3	x
4	2
5	x
6	3
7	√
8	=
9	INV RTN

Flowchart



OPERATION		READ-OUT	
(Select RUN mode)	[MODE] [1]	0.	
(Execute program)	[R/S]	0. [EXC] PRO	
(For a = 7)	7 [R/S]	169.7409791 [EXC] PRO	Result S for a = 7
(For a = 15)	15 [R/S]	779.4228634 [EXC] PRO	Result S for a = 15

* If a program includes an RTN instruction but neither ENT nor HLT, the program will, once started, not stop in an endless loop. To stop the program in such a case, press [AC].

2. Return to the first step of program depending on the condition of the contents of the X-register (display):

$x > 0$, $x \leqq M$

- $x > 0$: Return to the first step of program if the contents of the X-register is greater than zero and go to the next step otherwise.
- $x \leqq M$: Return to the first step of program if the contents of the X-register is equal to or smaller than the contents of the M-register and otherwise go to the next step.

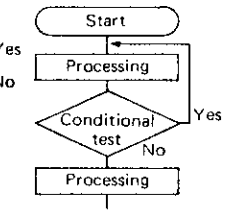
Example: Find the maximum of 456, 852, 321, 753, 369, 741, 684 and 643.

Operation: [MODE] [2]

[ENT] [INV] [x≦M] [INV] [Mcy] [INV] [RTN]

Step No.	Instruction step
1	ENT
2	INV $x \leqq M$
3	INV Min
4	INV RTN

Flowchart



OPERATION	READ-OUT	
[MODE] [1] [AC] [INV] [Mcy]	0.	Memory cleared
(Execute program) [RUN]	0. [RCL] [PRO]	
456 [RUN]	M 456. [RCL] [PRO]	
852 [RUN]	M 852. [RCL] [PRO]	
321 [RUN]	M 321. [RCL] [PRO]	
753 [RUN]	M 753. [RCL] [PRO]	
369 [RUN]	M 369. [RCL] [PRO]	
741 [RUN]	M 741. [RCL] [PRO]	
684 [RUN]	M 684. [RCL] [PRO]	
643 [RUN]	M 643. [RCL] [PRO]	
[MR]	M 852. [RCL] [PRO]	Maximum displayed

(Input data)

■ Applications

• Permutation and combination

Calculate nPr and nCr for ($n = 10$; $r = 4$) and ($n = 25$; $r = 5$).

$$\left[nPr = \frac{n!}{(n-r)!},\ nCr = \frac{n!}{r!\,(n-r)!} \right]$$

Programming:

[MODE] [2]

"LRN" displayed

[ENT] 10 [Kin] [1] [ENT] 4 [Kin] [2]

(Value of n) (Value of r)

[Kout] [1] [INV] [x!] [÷] [(] [Kout] [1] [−] [Kout] [2] [)]

[=] [INV] [x!] [=] [INV] [nCr] ..... 5040 (Permutation)

[+] [Kout] [2] [INV] [x!] [=] ..... 210 (Combination)

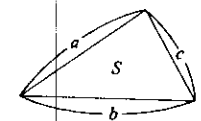
Operation:

[MODE] [1]

[RUN] 25 [RUN] 5 [RUN] ..... 6375600 (Permutation)

[RUN] ..... 53130 (Combination)

• Calculate the area of a triangle when the lengths of the three sides are given.



$$\left[s = \frac{a+b+c}{2},\quad S = \sqrt{s\,(s-a)\,(s-b)\,(s-c)} \right]$$

How large is S when $a = 18$, $b = 22$ and $c = 31$?

How large is S when $a = 9.7$, $b = 13.4$ and $c = 6.5$?

Programming:

[MODE] [2]

"LRN" displayed

[ENT] 18 [Kin] [1] [+] [ENT] 22 [Kin] [2] [+] [ENT] 31 [Kin] [3]

[÷] [(] 2 [)] [Kin] [4]

[×] [(] [Kout] [4] [−] [Kout] [1] [)] [×] [(] [Kout] [4] [−] [Kout] [2] [)]

[×] [(] [Kout] [4] [−] [Kout] [3] [)] [÷] [(] [√] ..... 194.2702692 (Area S)

Operation:

[MODE] [1]

[RUN] 9 [.] 7 [RUN] 13 [.] 4 [RUN] 6 [.] 5 [RUN] ..... 29.61549594 (Area S)

• **Sort sales slips by item code and add up the total of each item (for five items).**

Code	Amount
3	2870
2	1960
5	3850
5	1250
1	2500
2	2310
3	1850
5	4370
3	5360
1	2220
2	1450
4	6120
1	3100

→

Code	Amount
1	7820
2	5720
3	10080
4	6120
5	9470

Programming:

[MODE] [2]
↓
"LRN" displayed

[INV] [Nd] [INT] [Kin] [6]
[Kin] [+] [5] [=] [INV] [x≥M]
[Kout] [6] [Kin] [−] [5] [Kin] [+] [4] [=] [INV] [x≥M]
[Kout] [6] [Kin] [−] [4] [Kin] [+] [3] [=] [INV] [x≥M]
[Kout] [6] [Kin] [−] [3] [Kin] [+] [2] [=] [INV] [x≥M]
[Kout] [6] [Kin] [−] [2] [Kin] [+] [1] [=] [INV] [RTN]

Operation:

[MODE] [1]

[INV] [CMs] [x≥M] 3 [R/S] 2870 [R/S] 2 [R/S] 1960 [R/S] 5 [R/S] 3850 [R/S] 5 [R/S] 1250 [R/S]
1 [R/S] 2500 [R/S] 2 [R/S] 2310 [R/S] 3 [R/S] 1850 [R/S] 5 [R/S] 4370 [R/S]
3 [R/S] 5360 [R/S] 1 [R/S] 2220 [R/S] 2 [R/S] 1450 [R/S] 4 [R/S] 6120 [R/S]
1 [R/S] 3100 [R/S]

[Kout] [1] ····· 7820 (Amount of code No. 1)
[Kout] [2] ····· 5720 (Amount of code No. 2)
[Kout] [3] ····· 10080 (Amount of code No. 3)
[Kout] [4] ····· 6120 (Amount of code No. 4)
[Kout] [5] ····· 9470 (Amount of code No. 5)

• **Calculation for loan-repayment (Equally divided monthly repayment)**

Formula: $P = PV \dfrac{i}{1-(1+i)^{-n}}$

P: Amount of monthly repayment
PV: Amount of loan (Kin 1)
i: Monthly interest (Kin 2)
n: Number of times of repayment (Kin 3)

* The amount of repayment will be calculated in units of dollar by counting 50 cents or more as 1 dollar and disregarding the rest.

1) We borrow $30,000 at an annual interest of 7.65% for 10 years. What is the amount of monthly repayment?
2) We borrow $5,000 at an annual interest of 5.05% for 5 years. What is the amount of monthly repayment?

Programming:

[MODE] [2]
↓
"LRN" displayed

[INT] 30000 [Kin] [1]
[INT] 7 [.] 65 [÷] 12 [x≥t] 2 [=] [Kin] [2]
[INT] 10 [×] 12 [=] [Kin] [3]
[Kout] [1] [×] [Kout] [2] [+] [(] 1 [+] [Kout] [2] [)] [yˣ] [Kout] [3] [%] [=]
[=] [MODE] [7] [0] ····· 358 (Amount of monthly repayment)

Operation:

[MODE] [1] [R/S] 5000 [R/S] 5 [.] 05 [R/S] 5 [R/S] ··· 94 (Amount of monthly repayment)

8/SPECIFICATIONS

■ Basic features

- **Basic operations:** 4 basic calculations, constants for $+/-/\times/\div/x^y/\sqrt[y]{x}$, and parenthesis calculations.
- **Built-in functions:** trigonometric/inverse trigonometric functions (with angle in degrees, radians or gradients), logarithmic/exponential functions, reciprocals, factorials, square roots, cube roots, powers, roots, decimal ↔ sexagesimal conversion, conversion of co-ordinate system (R→P, P→R), random number, π, and percentages.
- **Statistical functions:** Standard deviation.
- **Memory:** 1 independent memory and 6 constant memories.
- **Capacity:**

	Input range	Output accuracy
Entry/basic functions:	10-digit mantissa, or 10-digit mantissa plus 2-digit exponent up to $10^{\pm 99}$.	
Fraction calculations:	Max. 3-digit mantissa for each integer, numerator or denominator and at the same time max. 8-digit mantissa for the sum of each part.	

Scientific functions:

$\sin x/\cos x/\tan x$	$\|x\| < 1440^\circ$ (8π rad, 1600 gra)	±1 in the 10th digit
$\sin^{-1}x/\cos^{-1}x$	$\|x\| \leqq 1$	— " —
$\tan^{-1}x$	$\|x\| < 1 \times 10^{100}$	— " —
$\log x/\ln x$	$0 < x < 1 \times 10^{100}$	— " —
e^x	$-227 \leqq x \leqq 230$	— " —
10^x	$\|x\| < 100$	— " —
x^y	$\|x\| < 1 \times 10^{100}$ $\begin{cases} x < 0 \rightarrow y$: integer $\\ x = 0 \rightarrow y > 0 \end{cases}$	— " —
$x^{\frac{1}{y}}$ ($\sqrt[y]{x}$)	$\|x\| < 1 \times 10^{100}$, $y \neq 0$	— " —
$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$	— " —
$\sqrt[3]{x}$	$\|x\| < 1 \times 10^{100}$	— " —
x^2	$\|x\| < 1 \times 10^{50}$	— " —
$1/x$	$\|x\| < 1 \times 10^{100}$, $x \neq 0$	— " —
$x!$	$0 \leqq x \leqq 69$ (x: natural number)	— " —
POL → REC	$\|r\| < 1 \times 10^{100}$	— " —
	$\|\theta\| < 1440^\circ$ (8π rad, 1600 gra)	
REC → POL	$\|x\| < 1 \times 10^{100}$	— " —
	$\|y\| < 1 \times 10^{100}$	
° ' "	up to second	
π	10 digits	

■ **Programmable features:**
- **Total number of steps:** up to 38 (1 step performs a function).
- **Jump:** Unconditional jump (RTN), conditional jump ($x > 0$, $x \leqq M$).

■ **Decimal point:**
Full floating with underflow.

■ **Read-out:**
Liquid crystal display.

■ **Power consumption:**
0.00043 W

■ **Power source:**
Two AA size manganese dry batteries (UM-3) give approximately 7,000 hours continuous operation (approx. 8,000 hours on type SUM-3).

■ **Ambient temperature range:**
0°C – 40°C (32°F – 104°F)

■ **Dimensions:**
21H x 77W x 150mmD (7/8"H x 3"W x 5-7/8"D)

■ **Weight:**
162 g (5.7 oz) including batteries.

Estimado cliente,

Muchas gracias por haber comprado nuestra calculadora científica.

Esta calculadora de alto rendimiento, tamaño bolsillo, emplea lógica algebraica verdadera (juzga la precedencia de las operaciones) y permite el uso de hasta 18 paréntesis en seis niveles. Sus características más destacadas consisten de 44 funciones, registros de siete memorias, y hasta 38 pasos de programa para computación repetida.

Este manual le familiarizará con las muchas habilidades que esta unidad altamente capacitada puede brindarle.

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